



Screening Nutritional Status of Hospitalized Patients with Nutritional Risk Screening 2002 and Subjective Global Assessment Tools

Hastanede Yatan Hastaların Beslenme Durumlarının Nutrisyonel Risk Skoru 2002 ve Subjektif Global Değerlendirme ile Taranması

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Abstract

Aim: The assessment of the nutritional status of hospitalized patients is important to detect individuals who are under malnourishment risk and malnutrition-related conditions. The present study aimed to screen the nutritional status of hospitalized patients with Nutritional Risk Screening 2002 (NRS-2002) and Subjective Global Assessment (SGA) and to compare the results of two screening methods in predicting malnutrition.

Material and Method: NRS-2002 and SGA were administered to 134 non-critical service patients within the first days of hospital admission. Tool performance in predicting malnutrition and the association with length of hospital stay (LOS) were analyzed.

Results: 22.4% (n=30) of the patients were at nutritional risk when screened with NRS-2002; when screened with SGA, 35.8% (n=48) of the patients were found to be malnourished (p=0.015). The hospital LOS (day) of malnourished patients and non-malnourished patients according to NRS-2002 were similar. However, according to SGA, the hospital LOS of malnourished patients was longer than non-malnourished patients (17.90±16.93 vs 10.79±11.23) (p=0.004). In both screening tools, most of the malnourished patients were overweight or obese (the total overweight and obese patients rate 70% and 75% according to NRS-2002 and SGA; respectively). Factors associated with malnutrition were only age and hospital LOS (p<0.05).

Conclusion: Considering current criteria for nutritional risk, NRS-2002, as an objective and remarkably powerful tool, seems to provide a better yield for an objective assessment. Besides this, adding subjective parameters to the assessment by applying SGA could increase the capability of detecting the nutrition risk of hospitalized patients for a comprehensive nutritional assessment.

Keywords: Malnutrition, nutritional assessment, nutritional risk screening 2002, subjective global assessment.

Öz

Giriş: Hastanede yatan hastaların beslenme durumlarının değerlendirilmesi, malnütrisyon riski altında olan hastaların ve malnütrisyonla ilişkili diğer durumların tespit edilmesi için önemlidir. Çalışmada, hastanede yatan hastaların beslenme durumlarının Nutrisyonel Risk Skoru 2002 (NRS-2002) ve Subjektif Global Değerlendirme (SGD) tarama araçları ile taranması ve malnütrisyonun belirlenmesinde iki tarama yönteminin sonuçlarının karşılaştırılması amaçlanmıştır.

Gereç ve Yöntem: NRS-2002 ve SGD, hastaneye kabulün ilk günlerinde 134 kritik olmayan servis hastasına uygulanmıştır. Malnütrisyonun tespitinde tarama aracının etkinliği ve hastanede kalış süresi ile ilişkisi analiz edilmiştir.

Bulgular: NRS-2002 ile tarandığında hastaların %22,4'ü (n=30) beslenme riski altında olduğu, SGA ile tarama yapıldığında hastaların %35,8'inin (n=48) malnütrisyonlu olduğu saptanmıştır (p=0,015). NRS-2002'ye göre yetersiz beslenen hastaların ve yetersiz beslenen hastaların hastanede kalış süreleri (gün) benzerdi. Ancak SGD taramasına göre malnütrisyonlu hastaların hastanede kalma süreleri malnütrisyonlu hastalara göre daha uzundu (sırasıyla; 17,90±16,93 ve 10,79±11,23) (p=0,004). Her iki tarama aracında da yetersiz beslenen hastaların çoğu aşırı kilolu veya obezdi (toplam aşırı kilolu ve obez hastalar NRS-2002 ve SGD'ya göre sırasıyla; %70 ve %75). Malnütrisyon ile ilişkili bulunan faktörler sadece yaş ve hastanede kalış süresiydi (p<0,05).

Sonuç: NRS-2002, beslenme riski için mevcut kriterler göz önüne alındığında, son derece güçlü bir araç olarak, nesnel bir değerlendirme için iyi bir verim sağlamaktadır. Bunun yanı sıra, SGD uygulanarak değerlendirmeye subjektif parametrelerin eklenmesi, kapsamlı bir beslenme değerlendirmesi için hastanede yatan hastaların beslenme riskini tespit etme kabiliyetini artırabilir.

Anahtar Kelimeler: Malnütrisyon, beslenme durumunun değerlendirilmesi, nutrisyonel risk skoru 2002 (NRS-2002) ve subjektif global değerlendirme (SGD)

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INTRODUCTION

Malnutrition is an important health problem among patients of all healthcare settings around the world. Disease-related malnutrition is more common in malign disease and chronic diseases (cardiovascular disease, respiratory disease, liver disease, and renal disease) and is associated with higher hospital admission rates, increased length of stay in hospital, mortality and morbidity.^[1,2]

Hospitalization is also a factor leading to malnutrition due to poor feeding procedures and insufficient intakes of macro and micronutrients. The assessment of the nutritional status of hospitalized patients is important to detect individuals who are under malnourishment risk and malnutrition-related conditions. The American Society for Parenteral and Enteral Nutrition (ASPEN) recommends a nutritional screening for all patients at the beginning of the hospitalization.^[3] In guidelines published by ASPEN, it is stated that a nutrition screening should be a component of the initial evaluation of all patients in all care settings (hospital, home) and that the screen should incorporate objective data such as height, weight, weight change, primary diagnosis, and presence of comorbidities.^[4] Applying screening tools is accepted as an effective method for nutritional screening. European Society for Parenteral and Enteral Nutrition (ESPEN) recommends Nutritional Risk Screening (NRS) 2002 to consider the nutrition risk of hospitalized patients.^[5] The NRS 2002 is a remarkably powerful nutritional screening tool: it is rapid, easy to administer, and does not require highly trained health care professionals. The Subjective Global Assessment (SGA) is a simple and effective tool to assess nutritional status of hospitalized patients by subjective assessment that evaluates abnormalities in food intake, gastrointestinal symptoms, functional capacity, diseases related to nutritional requirements and body composition. SGA is a diagnostic tool which determines the presence of a problem in the nutritional status of patients.^[6] It was reported that no single parameter was effective to determine malnutrition and the multitude of factors that influence nutritional status in all patients.^[7] To overcome the limitations of a single indicator, it has been recommended that more than two indicators of nutrition status be used to detect malnutrition in hospitalized patients. The objective and subjective parameters should be considered together for a comprehensive nutritional assessment.^[8] The Academy of Nutrition and Dietetics recommends that added to a nutritional screening by tool, receive patients appropriate nutritional monitoring and evaluation by health care professionals to avoid false negative or positive results on nutritional risk of patients.^[6] The capability of detecting nutrition risk may increase by this comprehensive assessment containing subjective parameters.

The present study aimed to assess the nutritional status of hospitalized patients screening with two different tools, NRS 2002 and SGA, which are commonly used in clinics.

Additionally to compare the results of two screening methods in predicting malnutrition of hospitalized patients and to observe their association with body mass index (BMI) and length of hospital stay (LOS).

MATERIAL AND METHOD

Participants

The study was conducted with 134 adult patients (male/female: 59/75) who were hospitalized in the clinics (hematology, neurology, gastroenterology, nephrology, endocrine, pulmonary disease and cardiology) of Malatya Training and Research Hospital between January 1 and August 30, 2016.

The sample size was calculated as the minimum of 88 patients based on the primary outcome variable: the detection of a 5% difference between the nutritional status and NRS 2002 and SGA tools and statistical power of 95%.

The exclusion criteria included: patients were (i) < 18 years old, (ii) hospitalized due to surgical operation, (iii) pregnant women, (iv) breastfeeding women, (v) bed-dependent, (vi) suffered an advanced disease that required palliative care.

The study was conducted in accordance with the Declaration of Helsinki Principles. Ethical approval Clinical Research Ethics of Erciyes University, Faculty of Medicine (2016/144). Written informed consent was obtained from the patients.

Study Design

In the cross-sectional study demographic data (age, gender), BMI, cause of hospitalization and hospital LOS were recorded. For the nutritional assessment, all patients were screened with NRS 2002 and SGA within the first days of admission to the patients. And also the edema and the acid were evaluated by the physician. The primary predictors of interest in our study were the NRS 2002 and SGA results of patients.

In the beginning, 168 patients were included to study but 34 patients did not complete the screening process by the reason of missing data and were excluded from the study. Finally, 134 patients completed the nutritional screening (**Figure 1**).

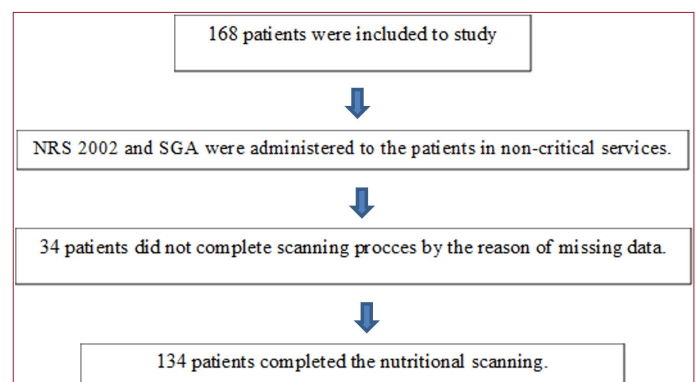


Figure 1. Study design

BMI Classification

BMI as an objective measurement, refers to the weight for height, which is valid for both genders and all age groups. BMI classification according to WHO refers to, <16.5 kg/m² severe malnourished, 18.5 kg/m² malnourished, 18.5-24.9 kg/m² normal weight, 25-29.9 kg/m² overweight, ≥30 kg/m² obese in adults 9. ESPEN recognises malnutrition as, patient has (i) weight loss >10–15 % of body weight in last 6 months; (ii) BMI <18.5 kg/m²; (iii) level B and C (mild-to-moderate and severe malnourished) Accordig to SGA or score ≥3 according to NRS 2002; (iv) serum albumin <30 g/L (out of hepatic and renal dysfunction) 10.

Nutritional Status

The nutritional status of all patients was screened both NRS 2002 and SGA within the first days of admission to the patients by a trained dietician.

The patients were classified as being nutritionally risk (NRS+): total score ≥ 3 or nutritionally risk-free (NRS-): total score < 3 according to NRS 2002 results.

The SGA screening normally provides three alternative categories for nutritional classification: well nourished (A); mild-to-moderately malnourished (B); or severely malnourished (C).

To facilitate the analysis of the influence of the nutritional status on the outcomes, to allow comparison with the NRS 2002 and SGA, patients were grouped as being either non-malnourished (A) or malnourished (B or C; included mild-to-moderately malnourished and severely malnourished according to SGA results). In addition, according to the results of two screening tools, patients were grouped as being malnourished [included patients on (NRS+) or SGA (B or C)] and non-malnourished [included patients on (NRS-) or SGA (A)].

Statistics

Continuous variables were expressed as the mean and standard deviation. Statistical differences between groups were assessed using Chi-Square and Fisher exact tests for categorical variables, while the Student's t-test was used for continuous variables.

In order to analyze which variables affected the prevalence of malnutrition, a logistic regression analysis was performed, in which malnutrition according to the NRS 2002 and SGA was considered the dependent variable separately. The level of significance used was 0.05. Statistical analysis was carried out with IBM SPSS Statistics 22.0.

RESULTS

Nutritional Screening NRS 2002 and SGA Scores Frequencies

A total of 134 adult patients (59 men/75 women) were included in to study with a mean age of 64.58±16.08 years. **Table 1**

shows the results in terms of both nutritional screening tools. According to SGA, 86 (64.2%) of the patients were classified as well nourished, 48 (35.8%) were classified as malnourished (B or C; 47 of them were mild-to-moderately malnourished and 1 of them was severely malnourished). According to NRS 2002, 104 (77.6%) were nutritional risk-free (or non-malnourished), 30 (22.4%) of the patients were classified as nutritionally risk (or malnourished).

Table 1. The nutritional status of the patients according to NRS 2002 or SGA

Nutritional status	NRS 2002		SGA		p
	n	%	n	%	
Malnourished	30	22.4	48	35.8	0.015*
Non-malnourished	104	77.6	86	64.2	
Total	134	100	134	100	

*p<0.05

The main data related to the nutritional status of patients in terms of both nutritional screening tools are shown in **Table 2**. Malnourished patients according to both nutritional screening tools have similar profiles in terms of gender and BMI to those of non-malnourished patients. There are different results in age profile of patients among tools. Although the mean the age of malnourished patients is similar with non-malnourished patients according to SGA, the mean age of malnourished patients was higher than non-malnourished patients according to NRS 2002 (74.83±12.50 vs 61.63±15.82) and most of them (malnourished patients) are ≥65 years (25 vs 5) (p<0.001).

BMI Classification and Nutritional Status

In both screening tools most of the malnourished patients were overweight or obese (BMI >25 kg/m²) (the total overweight and obese patient rate 70% and 75% according to NRS 2002 and SGA; respectively) and only 6.7% of the malnourished patients, the BMI levels were below the 18.5 kg/m² (p>0.05) (**Table 2**). According to SGA assessment weight loss in the last 6 months was higher in men than women (3.97±5.85 kg and 2.16±3.66 kg, respectively; p=0.041) (data not shown in table).

Length of Hospital of Stay and Nutritional Status

The hospital LOS (day) of malnourished patients and non-malnourished patients according to NRS 2002 were similar. However, according to SGA screening the hospital LOS of malnourished patients was longer than non-malnourished patients (17.90±16.93 vs 10.79±11.23; p=0.004) (**Table 3**).

Factors Associated with Malnutrition

A logistic regression analysis was performed, which considered malnutrition as a dependent variable and age, gender, BMI, hospital LOS (day) as independent variables. Only age was associated with malnourishment according to NRS 2002 (OR: 0.92; OR CI: 0.88-0.96; p<0.001) and only hospital LOS was associated with malnourishment according to SGA (OR:1.03; OR CI: 1.00-1.06; p<0.021) (**Table 4**).

Table 2. Main data related to the nutritional status

	NRS 2002			SGA		
	Malnourished (n=30)	Non-malnourished (n=104)	p	Malnourished (n=48)	Non-malnourished (n=86)	p
Gender (male/female)	15/15	44/60	0.455	25/23	34/52	0.161
Age (years, mean±SD)	74.83±12.50 (44-92)	61.63±15.82 (18-90)	<0.001*	67.31±15.64 (20-92)	63.06±16.20 (18-90)	0.142
Age range (n, %)						
<65	5 (16.6%)	52 (50%)	<0.001*	17(35.4%)	40(46.5%)	0.213
≥65	25 (83.3%)	52 (50%)		31(64.5%)	46(53.4%)	
BMI (kg/m ²) (mean±SD, (min-max))	28.03±6.80 (15.49-49.08)	28.04±6.31 (13.67-45.58)	0.992	29.17±5.70 (18.26-49.08)	27.40±6.71 (13.67-45.58)	0.126
BMI classification kg/m ²						
(< 18.5)	2 (6.7%)	5 (4.8%)	0.720	1 (2.1%)	6 (7.0%)	0.278
(18.5-24.9)	7 (23.3%)	33 (31.7%)		11 (22.9%)	29 (33.7%)	
(25-29.9)	11 (36.7%)	29 (27.9%)		16 (33.3%)	24 (27.9%)	
(≥ 30)	10 (33.3%)	37 (35.6%)		20 (41.7%)	27 (31.4%)	
Cause of hospitalization (n, %)						
Hematologic diseases	3 (10.0%)	11 (10.5%)	0.038	5 (10.4%)	9 (10.4%)	0.671
Neurologic problems	6 (30.0%)	5 (4.8%)		5 (10.4%)	6 (6.9%)	
Pulmonary disease	5 (16.6%)	38 (36.5%)		17 (35.4%)	26 (30.2%)	
Gastrointestinal disease	4 (13.3%)	20 (19.2%)		7 (14.5%)	17 (19.7%)	
Renal disorders	4 (13.3%)	5 (4.8%)		5 (10.4%)	4 (4.6%)	
Metabolic problems	4 (13.3%)	17 (16.3%)		5 (10.4%)	16 (18.6%)	
Cardiovascular diseases	4 (13.3%)	8 (7.6%)		4 (8.3%)	8 (9.3%)	

*p<0.05

Table 3. Length of hospital stay and the nutritional status with NRS 2002 or SGA

Hospital LOS (day)	NRS 2002			SGA		
	Malnourished (n=30)	Non-malnourished (n=104)	p	Malnourished (n=48)	Non-malnourished (n=86)	p
(mean±SD), (min-max)	17.10±15.20 (2-60)	12.25±13.41 (2-81)	0.093	17.90±16.93 (2 – 81)	10.79±11.23 (2 – 75)	0.004*
0-9 day (n,%)	13 (16.7%)	65 (83.3%)	0.194	21 (26.9%)	57(73.1%)	0.002*
10-19 day	9 (25.7%)	26 (74.3%)		12 (34.3%)	23(65.7%)	
20-29 day	4 (36.4%)	7 (63.6%)		8 (72.7 (%))	3 (27.3%)	
≥30 day	4 (40.0%)	6 (60.0%)		7 (70.0%)	3 (30.0%)	

*p<0.05

Table 4. The factors of associated with malnutrition

Variable	Malnourished NRS 2002			Malnourished SGA		
	Odds Ratio (OR)	OR CI (%95)	p	Odds Ratio (OR)	OR CI (%95)	p
Age	0.92	0.88-0.96	<0.001*	1.01	0.99-1.04	0.220
Gender (male)	0.92	0.37-2.29	0.871	1.38	0.65-2.93	0.397
BMI	1.01	0.95-1.09	0.592	1.03	0.97-1.09	0.248
Hospital LOS (day)	0.97	0.94-1.00	0.099	1.03	1.00-1.06	0.021*

Logistic regression model. OR CI: Odds ratio confidence interval, *p<0.05

DISCUSSION

Screening the nutritional status of hospitalized patients, in the beginning, provides positive results on patients outcomes and on avoiding comorbidities. Malnutrition is a well-known factor that increases the length of stay in hospital, morbidity and morbidity.^[2] Determination of nutritional status helps physicians and clinical nutritionists to decide on the best regimen which should be prescribed for a patient.^[11] Although many nutritional screening tools have been developed, there is no screening tool considered to be the best standard for defining nutritional risk. Most methods are cumbersome and time-consuming and therefore not performed on a routine basis. NRS 2002 is the most commonly used screening method in hospitalized patients and ESPEN recommends the NRS 2002 for nutritional assessment. Patients are evaluated and scored for malnutrition and disease

severity in NRS 2002 to take into consideration the patient’s nutrition risk at the time of assessment and used to identify hospitalized patients who may benefit from nutrition support. It is relatively easy to calculate and does not require a significant amount of time or data points.^[12] SGA is also a simple and effective screening tool which has been developed to evaluate the physiological symptoms observed in functional capacity and malnutrition or the conditions involved in malnutrition. Different from NRS 2002, subjective parameters are used in the assessment. Screening tools contain different objective and subjective parameters and this may lead to determine malnutrition rates at different levels. Therefore, there are many studies comparing these screening tests in the literature and they also found different malnutrition rates among tools. In a cohort study, 7973 adult patients from 47 hospitals scanned

to determining nutritional status and the rate of malnourished patients was found 36.9% by NRS 2002 and 44.9% by SGA.^[13] Fernández et al.^[14] found malnutrition rate 35.8% according to NRS 2002 and 62.1% according to SGA in hospitalized patients. Konturek et al.^[15] scanned 815 hospitalized patients and found a malnutrition rate of 44.6 % according to NRS 2002 and 44.6 % according to SGA. In a study conducted by Olivares et al.^[16] 21.3% of the hospitalized patients were malnourished according to NRS 2002; and 19.5% of the patients were malnourished according to SGA. Raslan et al.^[17] conducted a study with the aim of evaluating the ability of NRS 2002 and SGA to predict malnutrition related to poor clinical outcomes. They found that of the patients screened, 27.9% were at nutritional risk (NRS+) and 38.9% were malnourished (SGA B or C). In the current study, we found that malnutrition rates were 22.4% according to NRS 2002 and 35.8% according to SGA. Consistent with most of the other study results, in our study; the rate of malnourished patients among NRS 2002 was lower than among SGA. This result may be related to subjective parameters included in SGA. Because objective and subjective parameters alone have some limitations on determining nutritional status, it is recommended that objective and subjective parameters should be used together for a comprehensive nutritional assessment.^[7] Among objective parameters, anthropometric measurements, are effective in the diagnosis of malnutrition. BMI is one of the most commonly used anthropometric measurements in the clinic but it is not sufficient alone to determine malnutrition. Malnutrition is also detected at a normal weight or even in overweight patients. There are also studies reporting that the BMI of malnourished patients is higher than the BMI of non-malnourished patients. In a study conducted by Borek et al.^[18] 292 patients with renal disorders in Poland, were screened by using NRS 2002 and SGA methods, they found that 38% of the patients determined on nutritional risk were weighted or obese and only 8.4% of the patients with BMI below 18.5 kg/m² at risk of malnutrition. In the University Hospital of Haukeland Norway, 3279 patients were screened by using NRS 2002, 12% of overweight patients and 11% of obese patients were found on nutritional risk.^[19] In the current study, we found that among NRS 2002 screening, malnourished patients 36.7% of them were overweight and 33.3% were obese. These rates for SGA screening, were 33.3% and 41.7% for overweight and for obese, respectively. All these results show that weight status and BMI of the patients, as a single parameter, did not alone reflect completely the nutritional status and malnutrition risk of hospitalized patients.

Age, prolonged hospital stay and increased complications are among the independent risk factors of malnutrition. The prevalence of malnutrition is 5 times higher in patients over 80 years of age than in patients under 50 years of age.^[20] Raslan et al.^[21] screened hospitalized patients with NRS 2002 and detected malnutrition prevalence 42% in elderly patients (>65y old), and 27.9% in all patients. In a study, malnutrition was found 53% of patients over the age of 64 according to SGA screening and 46% according to NRS 2002 screening.^[22] In our study, according to NRS 2002 results, the rate of malnourished

patients was found 8.8% of the patients aged <65 years and 32.5% of the patients aged ≥65 years (<0.001). In SGA results, the rate of malnourished patients was found 29.8% of the patients aged <65 years and 40.3% of the patients aged ≥65 years (p>0.05).

Length of hospital stay is an important independent factor affecting malnutrition. A prolonged length of hospital stay is related to deterioration of the nutritional status of patients and increased malnutrition rates. Previous studies have shown the impact of nutritional status on LOS.^[15,23,24] In a study conducted in Spain with the aim of assessing the nutritional risk of hospitalized patients using SGA, found a significantly relationship between nutritional risk and length of hospital stay. Correia et al.^[23] demonstrate that malnourished patients had significantly longer length of hospital stay than well nourished patients (16.77±24.5 days and 10.17±11.7 days, respectively). In a study conducted by Velasco et al.^[25] according to the NRS 2002 screening, the mean length of hospital stay was 8.9±7.9 days in patients without risk of malnutrition and 13.7±9.5 days in patients with risk of malnutrition and according to SGA screening, it was found to be 8.8±7.7 days in non-malnourished patients and 13.7±9.7 days in malnourished patients. Oliveira et al.^[24] conducted a multicenter prospective study, they scanned patients by SGA and found that the mean duration of hospital stay was 30.9±28.3 days for malnourished patients and 37.3±27.2 days for malnourished patients. In a study conducted by Konturek et al.^[15] it was found that the length of hospital stay was significantly shorter in the well-fed patients (4.0±4.2 days) compared to the malnourished patients (7.8±7.7 days) according to the NRS 2002 screening. We found that the hospital LOS (day) of malnourished patients and non-malnourished patients according to NRS 2002 screening were similar. But according to SGA screening the hospital LOS of malnourished patients was longer than non-malnourished patients (17.90±16.93 vs 10.79±11.23) (p=0.004). And in patients with the hospital, LOS is more than 30 days, 40% of them were malnourished according to NRS 2002 results and 70% of them were malnourished according to SGA results. In our present study, hospital LOS was associated with malnourishment according to SGA. This result gives a supportive finding that prolonged length of hospital stay increases malnutrition risk in hospitalized patients.

Study Limitations

The main limitation of this study was the group of patients was heterogeneous and have a different cause of hospitalization. There are so many previous studies accessing the nutritional status of patients in intensive care units. However, we studied with patients among the different causes of hospitalization with the aim of assessing patients' nutrition status in all hospitalized patients in different clinics. Another limitation could be related to the impact of malnutrition on the outcomes. The results for readmission rates and mortality could not be followed up which were evaluated in some other studies related to nutritional screening.

CONCLUSION

Our study showed that SGA identified higher rates of malnourished patients than NRS 2002. Screening tools have different characteristics and capabilities in detecting malnutrition. The NRS 2002, as an objective, remarkably powerful and modern instrument that was developed for hospital settings and is recommended by the European Society of Parenteral and Enteral Nutrition, seems to provide a better yield for an objective assessment. Besides this, adding subjective parameters to the assessment could increase the capability of detecting nutrition risk of hospitalized patients. Applying objective and subjective parameters together in nutritional evaluation provides positive results for a comprehensive nutritional assessment. Although these different results of the screening tools, nutritional risk or malnutrition should be detected as early as possible in all hospitalized patients to avoid possible outcomes of malnutrition.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Clinical Research Ethics Committee of Erciyes University, Faculty of Medicine (2016/144).

Informed Consent: Written informed consent was obtained from the patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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